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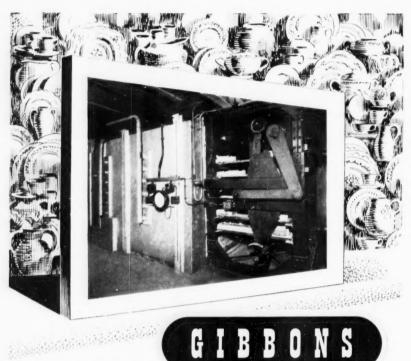
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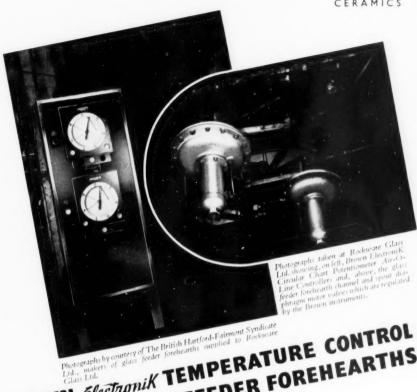
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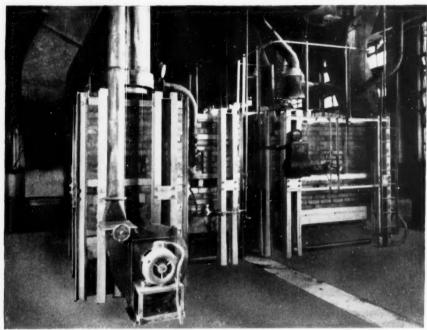


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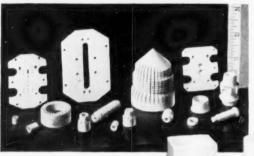
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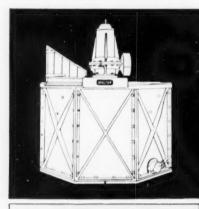
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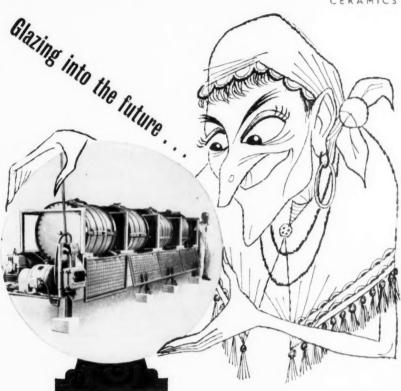
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# NOVEMBER 1953

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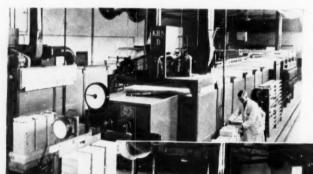
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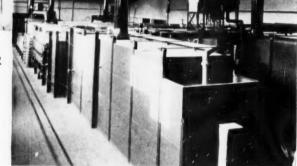
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# Ceramics

VOL. V

NOVEMBER, 1953

NO. 57

# The Cost of Smokelessness

A T the present time the electrical and gas industries are loud in their praise of the smokelessness of their respective fuels and the contribution they are making to banish "smog" in various parts of the country.

The political issues must not be separated from the economic. A large number of firms in the potteries have installed both gas and electrically-fired tunnel kilns thereby saving a not inconsiderable coal tonnage. But their whole costing system has been completely upset because almost immediately they suffered a very appreciable price rise for both gas and electricity.

An instance is quoted of where one gas installation for this reason, was scrapped, involving much waste of capital expenditure, and the kilns now operate again on solid fuel with their concomitant quota of smoke.

Both the electricity and gas industries are, for one reason or another, charging prices for their commodity to the pottery industry which are bringing these smokeless fuels very close to the stage of being uneconomic to the ceramic factory concerned.

In the ceramic industry the cost of fuel is indeed a very substantial proportion of the cost of manufacture, and the load is carried all the the year round, often seven days a week. Also the industry faces intensified competition from the revival of the Japanese and the German ceramic industries.

There is no doubt that fuel for the ceramic industries meets a rather special set of conditions, and it does seem a great pity that the vast impersonal suppliers of fuel find themselves incapable (for political reasons?) of being able to give the personal attention to this industry which it deserves.

Here seems a glaring instance of where a Fuel and Planning Board which was not responsible to Parliament could give consideration to the over-all picture and perhaps agree that the case of this industry was different, perhaps demanding of special treatment.

Certainly the British Pottery Manufacturers' Federation, the Chambers of Commerce and the respective Consultative Councils have batted against a stone wall in all their negotiations with the fuel industries up to the present.

# Trends in Firing in the Ceramic Industries

by

W. L. GERMAN, M.Sc., Ph.D. (Lond.), F.R.I.C.

A<sup>N</sup> article in a recent publication (Claycraft **26**, 376, 1953) gives some interesting details of the progress of tunnel kiln firing in one section of the ceramic industry, namely pottery.

The progress in continuous firing by town's gas in Stoke-on-Trent since 1932 is very marked.

Year	Cons	umption (c. ft. x	(103) N	o. of kill
1932	***	7,443		1
1934		88,519	***	9
1937	***	617,148		48
1939	***	1,341,337	***	74
1945		1,223,450	***	84
1951		4,228,980		204
1952		4,760,570	***	229

It is estimated that the industry is now only using 400,000 tons of coal as against 1,000,000 tons pre-war. This is all to the good and the trend is being maintained. Electric kilns show a similar increase over a period of years.

		No. of ki	lns in use	for pottery
Year				Decorating
1927	***			1
1937				18
1939			1	15
1945	***		3	26
1947			8	33
1949		2	23	44
1951		2	35	56
1953 (N		2	43	66

It would be unwise to predict that smokeless firing of ceramic ware of all kinds is just around the corner. There are still many works firing heavy clay wares and refractories, where the capital investment required to change



Open placed trucks waiting to enter tunnel biscuit kiln

to continuous firing methods is beyond the means of the company. Nevertheless the increasing price of fuel, and the growing public consciousness of the smoke nuisance is creating a growing interest in more efficient methods of firing intermittent ovens.

The rise in the price of the various fuels used in the industry over the years is reflected in the following table.

and other reasons cannot yet be scrapped.

## **Tunnel Kiln Firing**

For a long time in the Staffordshire potteries the trend was to adopt firing by town's gas. This was a policy fostered by the local authority, who reduced the price of gas to a level where it could compete with producer

					P	rice (pene	e therm	net)
Fuel				Cal. value	1936	1946	1949	1953
Coal				13,500 B.T.U./lb.	0.98	1.8	2.38	2.92
Coke				13,000 B.T.U. lb.	1.25		3.52	3.65
Heavy	fuel oil			18,900 B.T.U./g L	2.3	3.65	4.97	5.97
Town	gas (Stol	ce/Tre	nt)	475 B.T.U. c. ft. 1 max.		3.68	9.38	14.0
				f min.		3.58	5-35	9.0
Coke	producer	gas		140 B.T.U. c. ft.		3.63	4.34	4-46

The price of town's gas varies according to the consumption. The prices for electricity now involve a charge for maximum demand together with a flat rate for units supplied in addition. The latter charges are also linked to the price of coal. It is thus not possible to compare prices directly on the basis of pence per therm since the maximum demand may vary on different installations.

On the basis of an 80 per cent. load factor the following figures show the variation in price of electricity over the period 1938 to 1953 in the Midland Region. Prior to 1951 there was a higher tariff for decorating kilns.

1	Average price ( at 80% lo		CC	pal
Year	Decorating kiln	Biscuit and glost kiln		d.
1938	12-2	8-05	17	10
1939	12-4	8-2	18	6
1946	18.0	15.0	40	5
1949	19-1	16.6	48	9
1953	21-4	21.4	64	5

These two sets of figures are sufficient to emphasise the rapid increase in the price of fuel in post-war years, and it is evident that fuel saving is now a matter of considerable importance to all sections of the industry.

This can be considered under various headings, but since we still have plants employing continuous and intermittent firing it will be convenient to consider how efficiency is being improved in tunnel ovens and what are the prospects of their extended use, and also how various devices can improve those intermittent kilns which for financial

gas, bearing in mind the capital cost, and labour and other charges in running a gas producer.

The rapid increase in the price of gas has altered this state of affairs and this, coupled with the difficulty of getting a supply immediately, has led to active consideration of alternative fuels. Some manufacturers have pointed out that fuel oil is now relatively a much cheaper fuel than gas. The higher efficiency of some types of electric oven has also tended to lower the difference in firing cost which formerly restricted the use of electricity.

Those who are already committed to gas firing have in many cases made successful attempts to increase the efficiency of their ovens. These take the form of

- (a) increasing the pay load by dispensing with saggars, or by reducing the thickness and weight of kiln furniture;
- (b) reducing heat losses by improved insulation:
- (c) using waste heat;
- (d) obtaining more efficient combus-

#### Increasing the Pay Load

Where it is necessary to use saggars for firing, the ratio of ware to saggers on a weight basis is in most cases about 1:2 or more. Very small articles which can be densely packed are an exception.

Some typical setting densities are given in the table below (the weights refer to loads per truck).

With the exception of small articles like electrical porcelain, open placing

#### CERAMICS

results in an increased density of setting. The improvement is greatest with biscuit as might be expected. With this in view successful attempts have been made by some manufacturers to use open placing in open fired kilns, and this has materially decreased the cost of firing.

in the number of tiles which can be set on each truck. It is hoped to decrease the crank thickness still further

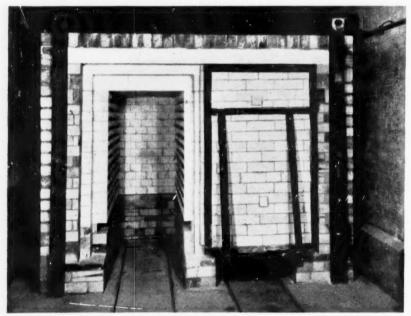
#### More Efficient Combustion

It is obvious that more efficient combustion will reduce firing costs. It has always been necessary to use more air

			Truck load				
Ware			Placing	Wt. ware lbs.	Wt. props, bats, saggars etc. lbs.	Ratio ware: saggar etc.	
Glost earthenware		***	Saggars	565	1,570	1:2-8	
Ditto			Open	272	583	1:2:1	
Biscuit, ditto	***		Saggars	1,050	2,520	1:2-4	
Ditto ditto	***		Open placed	1,068	1,464	1:1:4	
Small electrical por	celain	***	Saggars	1,140	1,182	1:1.04	
Ditto	***		Open placed	672	686	1:1.02	

In the case of glost firing a recent development has been the reduction in the thickness and weight of tile cranks. This has been achieved without loss of mechanical strength. In this way it has been possible to reduce the thickness of the crank from 4 in. to 1/8 in. and this has meant a significant increase than is theoretically necessary to burn the gas completely and to carry out certain reactions in the clayware. This is because it is impossible thoroughly to mix the gas and air with the usual type of burner.

A development is the use of premixed gas and air. The premixing is



A new intermittent electrically-fired pottery decorating kiln, details of which were given in the September, 1953 issue of "Ceramics." The installation comprises a pair of rectangular kilns, set side by side, and used alternately.

done in special machines with adequate safeguards against explosions. This mixture is fed to the kiln burners. The results have been completely successful, and it has been stated that in one instance the gas consumption for two kilns is now no more than that formerly burnt in one under the normal system. Recirculation of air is now possible at higher temperatures than was formerly possible and this has resulted in more uniform heating of the setting.

#### Insulation and Waste Heat

Improved insulation is reflected in more comfortable working around modern kilns. Much heat is still being wasted from the older types of kilns. The external application of loose insulating fillers such as vermiculite has been effective in improving the insulation of some old kilns. The modern kilns pass waste gases to the main flue at lower temperatures than was formerly the case. In addition many schemes for using this waste heat in driers and for space heating are now in use.

### Electric Kilns

Electricity for heating finer types of ceramic ware has tended to increase. Compared with gas the rise in price has not been so marked in post-war years. Moreover in the Potteries it has not always been possible to obtain town's

While electricity is still on a fuel cost basis the most expensive fuel, the gap between it and others has tended to narrow. Moreover improvements in kiln design have reduced the fuel consumption so that in some cases electric firing compares favourably with other methods. It must also be remembered that open setting can be used since there are no flames or products of combustion to worry about.

Metal belts for carrying the ware through the heating zone achieved some popularity in the immediate postwar years for glost and enamel kilns. The high cost of replacing the nickel-chromium belt about every nine months has however, been a difficulty which has limited the more widespread adoption of these kilns. They did, however, show the possibility of greatly speeding up the firing times, and materially reduced firing costs over those of intermittent coal fired ovens.

The multipassage kiln showed that very good heat utilisation could be obtained with small cross section tunnels working in opposite directions (cf. W. L. German, *Trans. Brit. Ceram. Soc.* **50**, 375, 1951) and that the cost of firing ware in these was comparable with that of using other fuels. Moreover the kiln could be put down in a very small space—an important consideration in some factories.

There are certain disadvantages however. The initial cost, like that of other types of tunnel kiln, is high. Greater care has to be taken in placing the ware and in making the bats on which the ware travels if wrecks are to be avoided. In glost firing droppers also become a problem after a time. There is a fund of experience in using these kilns at home and abroad now and if means could be found to reduce the initial cost their use would probably spread.

### Intermittent Electric Ovens

The high cost of kilns of all types has tended to popularise the intermittent electric oven for glost and enamel firing in the smaller works, especially as their cost is now more reasonable.

The ovens take the form of large chambers heated by electric elements in the walls. The ware is either set on props and bats in the oven, or on a car which is pushed into the oven for firing. Such an oven may take about 600 dozen or more decorated cups. It can be fired overnight in an off peak load period, and if necessary, the firing can be automatically controlled and the current switched on and off by a time switch. There is thus no need for kiln shift workers. Such an installation can be added to at will, and in times of slacker trade some of the units need not be operated.

Although such a system is not as cheap to run on fuel cost as a continuous kiln, the low initial cost has meant that to small factories the benefits of electric firing in place of coal fired ovens are now possible for the expenditure of a few hundred pounds, whereas the cost runs into thousands for continuous kilns.

## **New Metallic Elements**

One hears that metallic resistors to operate at much higher temperatures are on the way. These are based on the

#### CERAMICS

element molybdenum, but in the new version it will not be necessary to seal up the metal in hydrogen. Such elements would be a boon, since they would have a greatly increased life at present operating temperatures and they would also be easier to handle than non-metallic types which are used for high temperatures at present, and whose resistance changes with use, necessitating expensive voltage regulating gear.

#### Intermittent Coal-fired Kilns

The intermittent kiln is very inefficient. The pay load is reduced by the need for protecting whiteware from flames and dust in saggars. In addition the insulation is often bad and the flue gases leave at a high temperature. The percentage of heat reaching the ware is often 5% or less

In the roofing tile trade, where much higher setting densities are obtainable, the efficiency is somewhat higher. E. Rowden gives the following data (Trans. Brit. Ceram. Soc. 52, 436, 1953)

for four kilns.

In the heavy clay trade, tunnel oven firing is expensive in initial capital costs. Thus a tunnel oven 300 ft. long may cost £60,000. Extensions in this direction tend, therefore, to be limited to the higher priced lines like floor tiles.

There is more incentive to retaining intermittent ovens in this trade and for spending money on improvements.

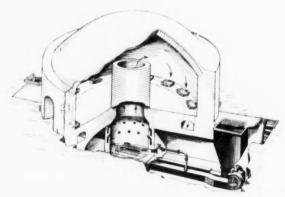
Thus we have seen the following changes in firing methods in some branches of the heavy clay and refractories industries.

- (a) The use of mechanical stokers:
- (b) more care in firing by the introduction of instruments and devices for controlling draught:
- (c) changes in design of the ware to reduce firing costs without loss of strength, etc.;
- (d) utilisation of waste heat.

## Mechanical Stokers

Mechanical stoking is gaining ground in connection with the firing of refractories, salt-glazed pipes, and tiles and

Condition of tiles when set	Leather hard	White hard	White hard	Leather hard
Firing temp ° C	1,150	1,125	1,020	900
Duration of fire (hours)	610	216	177	81
Heat losses %				
1. Heat in fired goods and setting at end of fire				
(max. temp.)	17-1	11-3	17:1	20.6
2. Heat storage in kiln at end of firing	9.6	14.2	21.6	18-7
3. Unaccounted for (heat in foundations, etc.)	5-2	22-3	7-2	15.0
4. Lost by radiation and convection from kiln surface	9.9	6.8	7.3	4.9
5. Lost in stack gases	51.9	41.6	40-9	36.5
", efficiency for firing goods	28-1	15.6	25-8	29.0

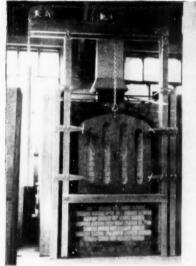


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Application of automatic stoker to kiln for firing refractories

(Courtesy, Mirrlees, Watson Co. Ltd

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Pottery Kilns
Vitreous Enamelling
Annealing
Stress Relieving
Plate Heating
All Kinds of
Heat Treatment

A PHOTOGRAPH
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POTTERY KILN
FOR BISCUIT FIRING
OF ART POTTERY
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STATION STREET, DUDLEY PORT TIPTON, STAFFS. quarries. It is also adopted for firing bricks using the overfeed type.

What may be regarded as another form of mechanical stoking is the firing of bricks in continuous kilns by pumping fuel oil through the feed holes in the top of the kiln. A method of doing this has been worked out in Sweden. Fuel oil is forced through the holes by a series of impulses produced by a pump. The timing of these impulses can be controlled as required. (Brit. Clayworker 62, 25, 1953.)

With round kilns it has been necessary to get the best results to build the kiln around the underfeed stoker which is set in a pit (The Mirrlees type). The results of a commercial trial with a kiln firing salt-glazed pipes by this method may be summarised as follows:—

Kiln internal diameter ... 26 ft. 6 in. Kiln load (pipes and fittings) ... 39 tons Finishing temp. ... 1,180-1,190° C. Firing time ... 90-96 hours Cooling time ... 80-90 hours Fuel consumption 9½-10 cwt./ton of goods

This compared with a fuel consumption of 16-17 cwt./ton of ware in the standard type of intermittent kiln.

The adaption of underfeed stokers to rectangular kilns firing refractories has been described (*Brit. Clayworker* **62**, 41, 1953).

Firing refractories to 1,450-1,500° C. a saving of 25 per cent. of fuel was reported. Similar experiments have been reported by J. Wright (*Trans. Brit. Cer. Soc.*, **52**, 513, 1953). A rectangular kiln firing fireclay refractories was fitted with two underfeed stokers in opposite corners so as to give a good temperature distribution. The result was a 50 per cent. fuel saving.

#### Utilisation of Waste Heat

Mr. E. Rowden's figures show that, for example in the roofing tile trade, the possibility exists of recovering the heat stored in the fired goods and the kiln structure, amounting to 25-40 percent. approx. of the total heat input. With kilns firing refractories, etc., the percentages tend to be higher.

A review of methods of waste heat recovery in the heavy clay trade has been published by the same author

(Trans. Brit. Ceram. Soc. 52, 69, 1953). Briefly they comprise interconnecting kilns so that the waste combustion gases from the kiln firing are used to preheat ware in the others. Drying of green ware is done by drawing air through kilns which are cooling, the moisture laden air being then passed to the atmosphere. The Minter system (Brick Clay Rec. 61, 102, 1922) used for round kilns in the U.S.A. and a method for rectangular kilns are described. Figures of fuel consumption show that a saving of 25-30 per cent. can be made by this method. Examples are given of the operation of these systems in typical plant.

Instances are also given of the use of waste heat for the operation of dryers both at home and abroad. In some cases all the drying is done by waste heat at a low cost.

For further details the reader is advised to consult the original paper.

## **Hollow Bricks**

Changes in design of bricks can facilitate drying and firing. Perforated bricks and faience blocks have been adopted widely on the Continent and in America. Lately they have begun to be manufactured in this country by the wire cut process.

Extension of this idea where the clays are suitable for wirecutting depends on persuading local authorities and builders that this brick is a perfectly good material for construction. Its advantages from the builders' point of view have been set out in Building Research Station Digest No. 53. April 1953 (H.M.S.O., London). Briefly this states that:

- (1) their strength is adequate;
- (2) they are lighter;
- (3) their durability, including frost resistance, does not seem to be inferior to that of solid bricks;
- (4) resistance of walls to penetration by rain is not affected since this depends more on construction than on the type of brick;
- (5) thermal insulation is improved.

In connection with the latter the bricks at present made in this country contain 10-15 per cent, of voids whereas in other countries the figure is often 50 per cent, with a consequent improvement in thermal insulation and fuel saving. From the manufacturers



point of view these bricks are easier to dry and to burn, since air and heat can penetrate readily to the centre of the brick. Higher fire travel rates are possible, and the fuel consumption per thousand bricks can be reduced. One firm has nearly halved its fuel consumption, and materially increased its output by turning over to perforated wire cut bricks.

#### Instrumentation

The use of instruments has now made control of firing a more definite operation and savings of fuel are resulting from it. Among these may be mentioned the use of pyrometers and draught indicators.

It is now possible to control the firing curve of tunnel ovens automatically. A rotating cam is incorporated which controls the temperature at all stages of the heating and cooling. Gas, oil and electrically fired kilns can be controlled in this way.

A device for controlling draught has been introduced recently to conteract the effect of variable wind speeds over the chimney stack. It consists of a damper vane which can be fixed to an opening on the side of the stack. The vane is delicately balanced by a counterweight. Increase in draught in the stack pulls the vane inwards admitting air to the stack. The pull on the fires is thus held steady.

# **NEW GLASS SALES COMPANY**

Sir Graham Cunningham announced at the annual general meeting of the Triplex Safety Glass Company Ltd., in London (28th October) that Quickfit & Quartz Ltd., of Stone, Staffordshire, manufacturers of Quickfit chemical plant in glass, and James A. Jobling & Co. Ltd., manufacturers of the well-known "Pyrex" ovenware, are jointly forming a new company for the development and sale of glass chemical plant and pipeline.

The new company will be called Q.V.F. Ltd. (the name is a contraction of "Quickfit" and "Visible Flow") and will have its offices at Mill Street, Stone, Staffordshire,

# The Drying of Tableware and Other Ceramic Goods

By the Jet Drying Method

by W. HANCOCK, M.I.B.R.E., A.M.I.E.E.

A PAPER presented by G. W. Bird and A. J. Dale before the British Ceramic Society (Pottery Section)\* focused attention on the improved thermal efficiencies and other attractive practical economies to be gained by the application of the directed air-jet principle to the drying of table earthenware on plaster moulds.

In this paper it was argued that early attempts in the tableware industry to improve on the traditional and very slow methods of drying involved the application of bulk drying principles, similar to those developed by the heavy clay industry. Bulk drying methods, however, inevitably involve certain basic disadvantages. Conditioned air of raised dry-bulb temperature was injected into some form of drying chamber through ports of large area, and selected its own paths towards the points of re-circulation and bleed-off. The overall rate of bulk drying is determined by the articles that dry slowest. Articles in certain positions relative to the air streams tend to dry too guickly, and often unevenly with cracking, which implies that the overall drying rate for all the articles in the unit must be retarded.

#### Practical Principles of Jet Drying

The jet drying principle, however, is entirely different in that it ensures that every article in a given unit is subjected to similar drying conditions, with the drying agent (hot air) possessing its optimum drying capacity at impact. The symmetrical application of the drying air to each article has meant that safe drying rates can be considerably accelerated, and the new method

provides the advantages of rapid drying, smaller number of moulds per maker, thermostatic dry-bulb temperature control to prevent overheating of the plaster moulds, prevention of moisture build-up in moulds, good shape control, high thermal efficiency and reduced fuel costs.

# Fundamental Principles of Drying and Jet Drying

The classical researches of W. H. Carrier and co-workers from 1911 onwards, led A. E. Stacey, Junr., with a desire to formulate specifications for high-efficiency ceramic dryers, to recount the following guiding rules:—

(1) The evaporative power of air in a dryer is proportional to the difference between dry-bulb and wet-bulb temperatures of the air as used, thus, 20° difference will cause evaporation to proceed twice as quickly as 10° difference.

(2) The rate of evaporation from a free water surface increases by the same amount for every 230 ft.p/m. increase in air velocity, i.e. at 230 ft.p/m. the evaporation rate is twice that in still air, at 460 ft.p/m., three times, and so on.

(3) The rate of evaporation is twice as great with direct or perpendicular impact, as with parallel or tangential impact.

To these guiding fundamental principles, Dale and Bird in a later paper now suggest that the following practical guiding rules be added:—

(a) Symmetrical drying, rather than homogeneous drying, is essential for safe rapid drying. Symmetrical drying implies drying at equal rates along lines concentric to the centres of the articles.

(b) The hot air should be directed immediately on to the articles while it is in its optimum drying condition.

G. W. Bird and A. J. Dale, "Jet-Drying of Whiteware", Trans. Brit. Ceram. Soc., 51, 559, 1952.

(c) Frequent recirculation of the correct fraction of the air is necessary to maintain the highest possible drybulb temperature, and to increase fuel economy.

(d) Position the off-takes for recirculation and bleed-off to atmosphere, so as to circulate the driest air and to bleed-off the wettest.

(e) Keep the dry-bulb temperature below 60° C. (140° F.) to avoid rapid deterioration of the plaster moulds.

## General Construction of Multi-Jet Dryers

The drawing—Fig. 1—gives a plan of a circular jet dryer. The circular type normally consists of twelve sectors, and each sector has eleven shelves which carry two moulds each, or twenty-two moulds per sector. With 6 in. to 8 in. flat-ware, the capacity of each dryer is therefore 264 moulds.

In the original standard design for flat dryers, sectors 12 and 1 were open to the shop, sector 12 being unloaded and sector 1 loaded. When sector 1 has been filled, the whole dobbin is rotated by hand 1/12th of a revolution or 30 degrees. Thus, sector 1 then moves into sector position 2, and so on.

In later designs, the loading and unloading points can be separated, loading being performed at sector position 1, with unloading at sector

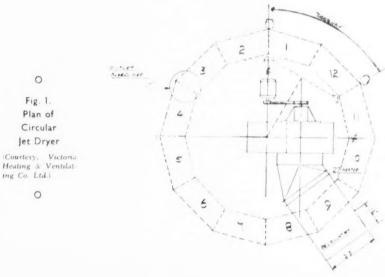
positions 9 or 10. In other words, the design of the dryer and positioning of loading and unloading points may be made to suit individual requirements.

In one of the modern cup jet dryers then, there are two sectors between filling and emptying positions, an arrangement which can be highly desirable with certain shop layouts. In this case, the two sectors between those open to the shop allow special drying of the moulds, and reduce the tendency towards a gradual increase in degree of water saturation of moulds during the working day.

The shelves in the jet dryers are hollow, with the jet orifices on the lower sides, thus directing the high velocity air jets entirely on to, or into the shapes being dried, which rest on their moulds on the shelf beneath. Still later improvements in design have increased the number of shelves per sector, by reducing the thickness of the shelves, or by reducing the distance between the jets and the ware.

# Air Supply, Temperature Control, and Air Movement

Air is supplied by a fan driven by a 3-phase motor sited on top of the dryer. The power consumption varies between 1.5 and 6 amps, per phase, according to the quantity and velocity of the air considered best for a given purpose.



The air passes through a steamheated radiator integral with the "battery" air-heater, to a central chamber into which the hollow shelves project, and so to the jets. After striking the articles, the air proceeds immediately either to the bleed-off or re-circulator positions.

Air bled-off to the atmosphere outside the shop is replaced by fresh air drawn in from the shop. Both the bleed-off and re-circulation ports are under separate adjustable damper

control.

Research has indicated the preferable positions for bleed-off and pick up for re-circulation. Thus, an efficient arrangement is as shown in Fig. 1, with the bleed-off between sector positions 3 and 4, and the re-circulation pick-up at sector 9.

The steam flow through the "battery" heater determines the drybulb temperature of the air delivered to the jets. It is controlled automatically by a "Sarco" steam-supply controller. This is a particularly sensitive and trouble-free device, hydraulically and non-electrical. Dry-bulb temperature control to within 0.5° F. is quite normal. It functions year in, year out without attention.

# Depreciation and Maintenance of Pottery Manufacturing Equipment

11.-Recording and Classifying Sales

by S. HOWARD WITHEY, F.Comm.A.

In this article the author discusses methods of recording and classifying sales and gives typical rulings for the pottery manufacturer's sales book.

I N many instances, the invoices and debit notes for pottery supplied to customers are made out in triplicate and consist of specially printed forms giving prices, terms of payment and arrangements in the matter of empty crates and packages, etc.; documents to be receipted when the pottery is delivered and from which the sale prices are usually omitted; and the copies to be retained for purposes of future reference, and all three copies should bear the same reference number. Both the customer's invoice and the receipt form should be passed on to the despatch department, and as soon as a van or lorry has been loaded, the distinctive numbers should be inserted on the forms and the essential details entered in the sales book or daybook from the respective carbon copies or counterfoils.

Under the prevailing conditions, the sales of pottery and glass often consist

of both cash and credit transactions, although naturally the ratios vary considerably according to the kind of trade and the special local circumstances. The items representing remittances received from customers may be recorded in a separate cash received book and posted direct to the credit side of a general sales account kept in the nominal or impersonal ledger, but it is not the practice to show each individual cash sale, as this would rapidly fill the cash book with a mass of relatively small amounts each of which would have to be posted to the ledger.

At all times, the greatest care should be exercised to ensure that all pottery, glass and heavy clay products leaving the packing house are properly charged out and eventually paid for, and in order to do this and be in a position to ascertain the volume of business transacted during the year or other account-

ing period some form of sales book or daybook is required. Many different patterns of book are in use at the present time, the number of columns provided by the printers, and also their headings, varying according to the size of the kilns and furnaces, the class of product and the ratio of credit sales to total turnover. In some offices, the subsidiary books are specially ruled and printed to work to specific ledgers or to satisfy other requirements, and when invoice books are kept on the carbon-copy principle it is usually possible to collect the sales items in the form of monthly or some other convenient totals for ledger posting purposes, and providing the invoiced amounts are recorded in such a way that the figures can be readily distinguished the maximum degree of accuracy can be guaranteed.

In cases where the remuneration of travellers is based on volume of sales or the amount of cash collected, the personal accounts kept in the customers' ledger should be divided into

Inv

Consignee

Packing

House

sections to enable the commission accounts to be readily compiled, and in this connection one of the advantages of the loose-leaf ledger system is that all the transactions with the same customer are shown in one continuous account, the folio of which is a permanent number. If no special classification of the sales is considered necessary or desirable, the monthly totals of the invoiced prices can be transferred direct to the credit side of a general sales account opened in the impersonal ledger, giving the date, i.e. the last day of the month, the sales book folio, and reading "By Sundries as per Sales Book," but in order to ascertain the volume of trade under two or more headings the book of original entry should be ruled with additional cash columns to enable the amount rendered on each invoice or debit note to be systematically classified and the monthly totals transferred to separate sales accounts. Two typical forms of sales book rulings are reproduced below:

Struc-

tural

Tiles

and

Rone

#### SALES BOOK

Ref.	Agent	No.	Details	Fo.	Total	Clay	Slabs	China
	Customer's Name and		Parti-	Led.		Domestic and	Decora-	
ate No.	Address	(	culars	Fo.	Total	Tahle- ware	tive"	Brick s

At the foot of each page of the sales book, also at the end of each month, a good check on the clerical accuracy of the records is afforded by seeing that the totals of the items extended into the classification columns agree, when added together, with the figure as shown in the "Total" column. Sales transacted at one or more factories or depots are sometimes recorded in separate books, and when this is the case the branch sales book will be quite independent of the sales book kept at head office. Quantities may be inserted in special columns provided for the

purpose, and if a "details" column is used some care is called for to ensure that all the items are extended in the column from where the "Total" invoiced prices should be posted direct to the debit side of the respective personal accounts kept in the sales ledger. In offices were accounting machines have been installed, a summary sheet should be made out when the invoices and ledger cards are entered up, the periodical sales totals being then produced automatically without the necessity of adding and balancing subsidiary books or journals.

# SOUTH AFRICAN NEWS

Ceramic Scholarship in South Africa

Applications are now being invited from candidates for the Robert Storm Ceramic Scholarship of value £1.000, which may be increased at the discretion

of the Trustees.

The successful candidate will be required to take at least a six or twelve months' course at the Natal Technical College, followed by a two-year course in Ceramics at an approved institution in the United States, or such other overseas country as the Trustees may approve, and thereafter to return to the Union and to spend at least two years in active pursuit of the industrial side of Ceramics in South Africa.

Vereeniging Factory Producing Vitrified Porcelain Tiles

Katinka Tiles (Pty.) Ltd. are now producing vitrified porcelain tiles at their factory in Vereeniging. The firm's products are suitable for swimming pools, hospitals, bathrooms, entrance halls, kitchens, columns and wall decorations of all kinds.

The tiles are manufactured entirely from South African raw materials and have non-skid, fire-resistant and perma-

nent qualities,

Petalite Found in Southern Rhodesia

Intensive prospecting in the eastern districts of Southern Rhodesia, near Fort Victoria, has resulted in the discovery of rich deposits of petalite, one of the minerals used in modern glass manufacture.

Mr. George Nolan, who made the discovery, has just returned to Rhodesia from a visit to England and the United States and has secured important contracts for petalite, which he is producing by modern mechanised means.

South African Ceramics in America

Five pieces of pottery, designed and made in Cape Town by the South African artists Alekandrs Klopcanovs and Alekandra Vestmn, have been singled out for special praise at the Fourth International Exposition of Ceramic Arts. The South African exhibit is most favourably reviewed in the American press and has also been brought into a television broadcast.

Zircon Production in South Africa

South Africa's first factory for the production of zircon, ilmenite and rutile, which is being built at Umgababa, on the Natal South Coast, twenty-five miles from Durban, is expected to be in production by the end of the year.

The deposits have been valued at £38,000,000, and are estimated to contain 2,000,000 tons of ilmenite, used in the manufacture of paints and pigments. 200,000 tons of zircon, used in the manufacture of ceramics, and 100,000 tons of rutile, which will yield titanium.

The deposits, which are considered to be among the largest in the world, were discovered in 1951, and will last for thirty-six years. The company intends to concentrate on export, but some supplies will be available for use in South Africa.

The Visco Engineering Co. Ltd.—We have received from the company, of Stafford Road, Croydon, a copy of the latest edition of their booklet, Modern Dust Collection and Fune Removal. Section I discusses the problems of dust collection in general and gives numerous examples of the application of Visco plant. Section 2 deals with the removal of noxious fumes and illustrates different types of equipment which the company have supplied for this purpose.

# An Automatic Pin-Loading Machine

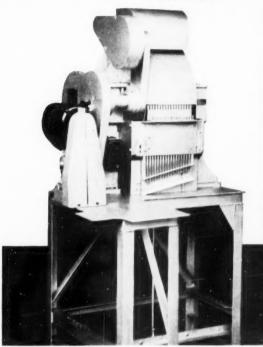
by TOM WATHEY

A DOPTION of the tunnel kiln by the pottery industry has led to the development of several new types of refractory support for the ware in its passage through the tunnel. Included in this "kiln furniture" is the Gimson pin crank, an arrangement of three perforated refractory pillars with dust-pressed refractory base and cover. These items are assembled to form a rigid, open structure giving easy access for placing the fourteen-seventeen pieces of flat ware which constitute a load.

Three-point support is given to the ware during glost and enamel firing by use of expendable refractory pins of triangular section, which fit the perforations in the pillars already mentioned. The pins are precision extruded by a patented, fully-mechanised process, which enables mass production of a clean-cut article with sharp contours at an extremely low cost.

## "Plucking" Reduced

The triangular section of the Gimson pin, it should be mentioned, has been found to reduce "plucking," and it is with this in mind that pin fits pillar at such an angle—10°—as will ensure that the area of contact between pin and ware-piece is extremely small. In this connection it is claimed that not only does a triangular pin present the minimum area of contact to the ware, but also that it is simpler to load into the pillars than most



Front view of pin-loading machine

other types of small expendable support. Another feature of the pin is that its low cost enables its use for one firing only, with the result that ware polishing is almost eliminated.

Reverting to the perforated pillars, it will be understood that these need loading with pins prior to each firing. Such loading may be done by hand, and this is still the case at some works. A completely loaded crank, however, carries forty-fifty pins, and manual loading calls for great concentration, with the result that hand methods are both tedious and costly. It early became evident, therefore, that the cost of servicing this excellent means of ware-support could be considerably reduced by the adoption of some form of mechanical loading. With this in mind a suitable machine was designed by the Goddard Engineering Co. Ltd., on which patents are pending, and this is now a production.

#### Speedy Loading

It is claimed that use of the machine which is shown in the illus-

tration enables one girl to do the work formerly done by four women loading pins by hand, and that the machine will load Gimson crank pillars as quickly as they can be presented by the operator.

As will be seen from the illustration, the machine stands on a welded angle-iron frame to which is secured a table of 1 in, mild-steel plate. The machine proper consists of a hopper into which loose pins are placed in bulk, with, at the base of the hopper, a revolving drum provided with circumferential grooves. This drum turns at only two revolutions per minute, and in close proximity to its face is a second, smaller drum provided with rubber wipers which sweep the pins circumferential grooves the already mentioned. Provision is made here, it should be added, for the rejection of dust and small particles of refractory material which pass from the machine via a series of "scavenging" grooves.

Pedal-operated Feed

The loaded drum in its slow motion, moves behind a shaped cover where the pins fall by gravity from the grooves into a series of "pick-up" tubes. It is here that a foot-operated mechanism releases a row of fourteenseventeen pins into a waiting pillar at each full movement of a spring-loaded tripping gear.

A hinged cover-plate is provided at a point below the drum feed, and in the event of such need arising it is a simple matter for the operator to remove any obstruction. The machine is driven by a ½ h.p. motor through a reduction gear, and its ball-race mounted shafts require a minimum of lubrication.

Thanks are expressed to The Goddard Engineering Co. Ltd. for assistance given in compiling the above notes: and to the patentees, J. Gimson and Co. (1919) Ltd., for their permission to publish.

Bernard W. E. Webber,—We hear that Bernard W. E. Webber has purchased the records, equipment, etc., of Webcot Limited, and is supplying and servicing all the electric kilns and lehrs in which this Company dealt. The address remains unchanged at Lower Street, Newcastle, Staffs., telephone Stoke-on-Trent 84909, and Newcastle 67927.

# REFRACTORIES AND STEELMAKING

The excellent co-operation which exists between the manufacturer of refractories and the steelmaker in this country was stressed by Mr. A. McKendrick, director of General Refractories Ltd., and managing director of the Glenboig Union Fireclay Co. Ltd., in his Presidential Address to the West of Scotland Iron and Steel Institute in Glasgow recently.

Early in 1939 the danger implied to sources of refractories material was envisaged. Silica sand for acid open hearth furnaces and basic bricks for basic open hearth furnaces were obvious examples. Exploitation of indigenous silica sand, the courage of the owners of the deposits in expanding output, of melting shop managers in its use, and of directors in supporting these experiments solved the first problem. Substitutes in raw materials were also found for basic bricks and cooperation achieved with the steelmaker in their use.

Mr. McKendrick outlined the recent development of dolomite bricks and carbon bricks and blocks. Dolomite bricks had been used with success at Corby and since their introduction in 1947 carbon bricks and blocks had made fairly rapid strides in this country in blastfurnace linings and hearths. While it was confidently expected to prove successful in this country, as abroad, he stressed that few furnaces had so far come off for inspection so that no final opinion could be offered as to the advantages of carbon.

# **POTTERY TOOLS**

Under the above title Messrs. Rock & Powell, London Road, Stoke, and Messrs. Astbury & Copeland, Market Street, Fenton, have produced a book on the Wimet cemented carbide tool. This material is produced by powder metallurgy and checked on a Vickers diamond hardness testing machine it registers up to 1,700.

Tools tipped with Wimet produce a wear resistance only surpassed by diamond. Already the pottery industry appreciates the advantages of the material for reduced pottery tool costs.

The booklet illustrates applications to the plate spreader tool, the plate profile tool and in the manufacture of saucers. The profile of cups and saucers are dealt with, when it is pointed out that the life of the Wimet tipped tool is more than 100 times greater than hardened steel. The booklet concludes with an approximate price list of the varying tools available to the potter.

# The Maintenance and Efficient Use of Ceramic Machinery

by E. M. BREEZE

(Messrs. Wm. Boulton Ltd.)

IT is now generally agreed that the pottery industry must benefit by the potter and the engineer working closely together with mutual understanding of the problems involved. I am, therefore, delighted that you have invited me to speak and enter into your discussions, and I have chosen as my subject the Maintenance and Efficient use of Plant and Machinery.

Maintenance, by which I mean repairs and replacements, forms a considerable part of any pottery engineers turn over. In our own case possibly

20 per cent. or 25 per cent.

Oiling, greasing and wearing part inspection, charts and time tables are good, and indeed necessary if maintenance is to be put on a preventive basis and stoppages avoided, or nearly so. All this can be done with great benefit to output provided management are satisfied that in their case the heavy cost of this organisation is more than covered by present loss due to stoppages and reduced output from machines which would be prevented by good maintenance.

When you spend your own hard earned money on say a washing machine, what do you expect if you are not to be disappointed. I think you expect the machine to be good looking, to be as good as it looks and you expect to have a book of instructions. I often give this example at the works. It always strikes me as unfair to both the user and the maker if installation, operating and maintenance instructions are not supplied with the machine. In saying this I know I am asking for trouble but there it is.

I should like now to speak on some individual machines, and parts.

Stone Breaker. Regular adjustment and replacement of worn jaws are well worth while. This prevents oversize material going to the ball mill and the ball mill doing work which can be more cheaply done by the stone breaker.

Ball Mills. Increased output is being obtained from ball mills mainly by increasing the speed of the drum and thicker grinding. The speed of a 7 ft. mill, for instance, has gone up from

17 to 22 r.p.m.

For smaller cylinders up to say 4 ft. 6 in. dia., the tendency is to substitute the friction clutch for the high torque or slip-ring motor. For the large mills the friction clutch is probably the best. Usually works maintenance staff are better qualified to make mechanical adjustments to a clutch rather than electrical adjustments to slip-rings and control gear.

Bearings. There seems to be no doubt that for the large mills white metalled bearings are the most reliable. In smaller mills ball-bearings are often fitted with satisfaction.

Electric Interlock. So that ball mills cannot be started up whilst the charge hole cover is removed, or the guards to the cylinder body out of place, it is now usual to have these electrically interlocked with the motor starter. This pleases the Factory Inspector very much.

Continuous or Batch Mills. Opinion varies on the merits of continuous mills and batch mills for flint and stone. It seems that more highly-skilled supervision is necessary for the successful operation of the continuous mill and its ancilliary equipment, and it would appear that the balance of merit in operation is with the batch mill and its ancillary equipment, and it pottery grinding its own materials, and not perhaps with the large mill supplying to the trade or a large group.

In the case of the smaller mill variations in output can be more easily

made.

At our works in rearranging records we came across notes on a conversation between Mr. Alsing, the inventor of the ball mill, and Mr. William Boulton, in 1867; from this it appears that to Mr. Alsing's instructions we supplied a ball mill to Mintons. I should think this is probably a record of one of the first ball mills to be used in the pottery industry. Instead of trunnions as now fitted, it had a shaft or axle through the mill which was carried in bearings mounted on wooden bearers. The lining and balls are described as being made of a mortar body. The lining and balls were made by Lea, Smith and Boulton of Church Yard Works, Burslem, where Josiah Wedgwood worked in his younger days.

Agitators. Nothing of recent years except the tunnel oven has caused such a revolution in the layout and appearance of pottery-making machinery.

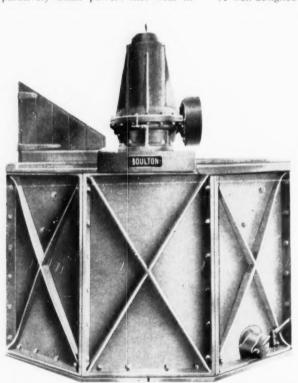
Generally speaking, for the comparatively small powers met with in the pottery industry, the worm reduction unit is the most suitable. It makes a compact unit. For its size it is an expensive piece of equipment because if it is to give long life it must be a precision job, and calls for precision machinery of the highest possible standard in its manufacture.

When asked to quote the engineer must know the exact duty expected from the unit if he is not to put forward a unit too large and, therefore, unnecessarily expensive, or a unit too small with consequent cover-heating and short life.

Assuming that the design and workmanship are good the factors most affecting the cost are, the horse-power of the motor, the centres of the worm and wheel and the material of which the worm and wheel are made.

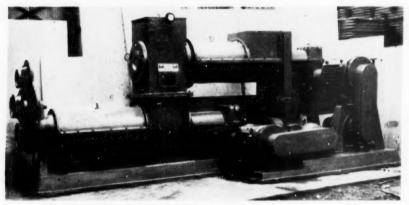
The factors affecting horse-power are, size of ark, that is depth and diameter, the weight and viscosity of the material, the degree of agitation required, and the shape of the ark.

A well-designed unit suitable to the duty should give many years of trouble - free service, but lubrication is most important. A gear running with insufficient oil or the wrong type of oil can be ruined in a few hours. The gear must have periodic inspection and a complete renewal of oil according to the maker's instructions.



## A worm gear driven blunger

(This and following illustrations by courtesy of William Boulton Ltd.)



An extruding pugmill with variable speed on both shafts and turret head carrying various sized mouthpieces

A great deal of work is being done to find out the respective merits of the Arm and Propeller Type Agitators. I think it can be said that for flint stone, ball clay slip and china clay slip, the arm and gate type are probably the most suitable and the most economical. For mixing arks especially, there appears to be much to be said for the propeller type agitator. It gives better mixing although at greater cost in horse-power.

Sifters. The vibratory sifter should not require much maintenance other than the care and renewal of lawns. The underside of the lawns should be brushed at least once a day and hosed off. Although flint and stone are usually carefully checked on delivery to the sliphouse a mistake in grinding will show up first on the lawns of the sifter. Underground material will quickly blind the lawns and give rise to a feeling that the sifters are not working satisfactorily.

Blungers. Blungers are now usually driven by individual worm gear units, and here again it is essential that the maker should know exactly the work to be done when quoting. For instance, a 7-ft. blunger on china slip may take 6 h.p., whereas the same blunger on a fireclay casting slip may take 15 h.p. Obviously, two very different gears are required. Where the blunger is used for abrasive fireclay slips special blades with renewable hard iron shoes are more economical than the standard knives.

Filter Press. There are two points I should like to mention in connection with filter presses.

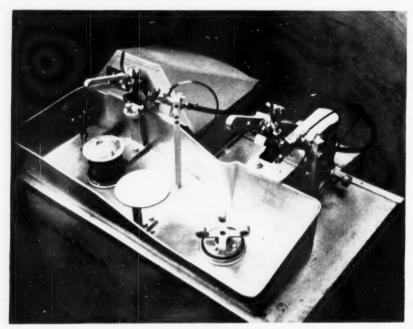
I do not think it is realised by everybody the enormous advantage to be obtained by the introduction of an air vessel in the pipe line between the pump and the filter press. The air vessel damps out what are really hammer blows from the pump and thus saves strain on the pipe line, the filter press frame, the trays and the cloths. Equally important it accelerates the rate of filtration because it maintains an almost constant pressure at the press resulting in continuous and not intermittent filtration. It is surprising to see the difference in the action or movement of a pressure gauge in the pipe line before and after the introduction of an air vessel.

Recently, we carried out a test on a customer's clay with the following result:

Thickness of cake: 1 in. Pressure: 90 lb. per sq. in. Pressing time: 7 hours.

Thickness of cake: 3 in. Pressure: 80 lb. per sq. in. Pressing time: 4 hours.

Admittedly, this test was carried out on a natural clay, and such a difference could not occur with a flinted body. It does show, however, that when ordering new filter presses it is worth while to have tests made on your body and not assume that your



A semi-automatic flat making machine

present thickness is necessarily the best, especially if there have been ball clay alterations.

De-airing Pugmill. I will content myself by saying that generally speaking it is true to say that what the dust-pan did and is doing with dust for the automatic tile press, the de-airing pugmill, in many cases, is doing for the semi-automatic and automatic making machines.

Many people think that the de-airing pugmill is an American invention but, in fact, the first de-airing pugmill ever made was made by William Boulton Ltd. to the order of Bullers Ltd. The inventors were Pennel, Hackley and Bullers Ltd. This pugmill was installed in 1923 and is working as satisfactorily as the day it was put in, but now it is working with over twenty other pugmills, one only of which comes from America, the others come from the original source.

Automatic Flat and Cup Machines. The semi-automatic flat and the automatic cup machine have now been generally accepted by most of the industry. We ourselves have supplied

over 400 of these machines at home and abroad. It is interesting to note that at the Paris Exhibition 1888, William Boulton was awarded a Gold Medal for an automatic cup machine.

Oval Machine. The oval dish machine has very ingenious mechanism. It is made to a high standard of precision and, if the moulds are to be interchangeable from one machine to another, the precision must be maintained in the sliding head. If, for any reason, this is not done, then if trouble is to be avoided in making, the moulds should be kept for use only on the machine on which they were modelled.

Dryers. I have heard it said that more hot air has been talked about dryers than almost anything else in the industry. I think I can say that it is generally agreed that up to now it has not been possible to design a mangle dryer which is as economical in steam consumption as the dobbin or rotary dryer. Whilst it is possible to take off on the other side with the mangle dryer, which may be an adage in some layouts, the versatility and

low maintenance cost of the rotary stove are telling advantages. There are over 600 Boulton stoves in use, and we have received orders for twenty-five during the last four weeks.

Plaster Mixer. The de-airing plaster mixer is now coming into common use. In most cases it gives a better face to the mould and a much longer life. In the latest patented type, the jug is not placed in the vacuum chamber but an exhausting head is placed on top of the jug itself, this makes the operation of mixing much quicker and easier and fast-setting plaster can be satisfactorily mixed if

this type of plaster is required.

In concluding I would like to say that reliability in a machine is well worth paying for. If your own engineering staff is too busy then local engineering firms will be pleased to undertake your maintenance. I believe that local engineering firms have an affection for your industry and all are trying to do a good job for the pottery industry.

Extracts from a talk given to the British Pottery Managers' and Officials' Association at Stoke-on-Trent, on the 9th November, 1953

## **NEW TESTS OF REFRACTORY BONDING MORTARS**

The deterioration of the refractory linings of water-tube boilers is a well-known problem and repairs of these linings represent a large proportion of the maintenance cost of boiler installations.

There is little comparative information at present available about refractory mortars and Xzit (G.B.) Limited, of 175 Piccadilly, W.I., have recently carried out a series of comparative tests on "Brickseal Bond," a refractory bonding material of their manufacture which is designed to increase the life of furnace linings.

The tests were carried out by Mr. W. Killner, a principal scientific officer, recently retired from the Admiralty, who is an accepted authority on furnace refractories. Six refractory mortars were tested alongside "Brickseal Bond" mortar. All the mortars examined were similar in that they were found to be sufficiently refractory to withstand operating conditions and fine enough to allow a thin joint to be made but they differed very markedly in bonding strength.

The method of test used to determine the bonding strength was that laid down for bonding mortars in the American Society for Testing Materials, Standards on Refractory Materials.

In this method, the bonding strength is determined by cementing two half bricks together on the 2½ in, x 4½ in, face with a joint 1/16 in, thick. After drying, the joints are broken by applying a load, using a standard machine.

The actual load tests to determine the



The binding property of "Brick-seal Bond" is shown in this photograph of a joint after carrying out the modulus of rupture test. "Brickseal Bond" is still firmly bonded to both faces of the brick

modulus of rupture were carried out by a London firm of consulting engineers and the results given below were obtained:

The A.S.T.M. Specification requires a mortared joint to have a modulus of rupture of not less than 200 lb./sq. in. and thes tests show that the "Brickseal" mortar complies with these requirements.

Brand	No. 1	No. 2	No. 3	Na. 4	No. 5	No. 6	Brickseal
Modulus of rupture lbs. sq. in	142	7	Less than	76	23	126	283

# "De Porceleyne Fles" Celebrates its 300th Anniversary

JOHN GRINDROD, B.A.(Com.)

FEW concerns achieve the distinction of celebrating their tercentenaries and the Dutch pottery of De Porceleyne Fles can be justly proud of its unbroken record of production since the year 1653. Famous especially for its blue Delftware, the firm claims by virtue of its origin and history to be the only pottery which, at the present time, may justly lay claim to being the bearer of that ancient tradition of craftsmanship.

At the time this old pottery was founded by David Anthonisz van der Pyet the ceramic industry of the Netherlands town of Delft was at the



Specimen of Royal Delftware with red. blue and gold decoration



Large jar in Royal Blue Delftware

peak of its prosperity. There were as many as thirty potteries operating within the walls of the town and this prosperity lasted for about one hundred years. The Delft products of the late 16th and early 17th century were very like the famous Italian Majolica, both in respect of their manufacture and their colours and decorations. Craftsmen of the Southern Lowlands of the Netherlands, already familiar with the Italian style, had taken refuge in the more northerly parts of Holland to escape religious persecution. They had established there this technique, using an opaque glaze, called tin-enamel, to cover the vellowish or brownish

earthenware body and to procure a white background for their decorations, which were sometimes blue, but more often multi-coloured.

Early in the 17th century Chinese porcelain began to find its way to Holland, especially the blue and white porcelain of the Wan Li period. The Delft potters could not fail to note the popularity which these beautiful wares enjoyed, and, although they were unable to produce the fine Chinese porcelain, since this technique was still unknown in Europe, they adopted blue as the predominant colour for these decorations, and, with the materials available, produced excellent reproductions. At first the Dutch potters confined themselves to the Chinese decorative motifs, but, in course of time, developed a style of blue decoration, which became the basis of the blue Delftware. Certain Chinese elements were still retained in the patterns and. indeed, can be recognised in blue Delftware to this day.

This development was encouraged by the Guild of St. Luke, who granted successful potters in the technique the title of "porcelain maker." This title still survives in the name "De Porceleyne Fles."

About the middle of the 18th century, however, the Dutch potters began to face severe competition from abroad, especially from England. In this country we were beginning to use a new technique, which produced a harder and cheaper product. Quicker methods of decoration were being developed. This competition caused some decline in activity among the Delft potters which, later, especially during and after the Napoleonic period, led to rapid decay. By the mid-19th century De Porceleyne Fles was the only one of the old Delft pottery firms still surviving. In spite of tremendous hardships and difficulties it is claimed that operations were never interrupted. To save the firm's existence, Mr. Piccardt, then in ownership, engaged English potters and started making domestic ware with printed decorations after the English fashion. Thus was hand-decorating superseded for some time to come.

It was in 1876, when Mr. Joost Thooft became owner of the business, that a great period of regeneration and of further development began. He set



A blue Delft earthenware painter at his work

himself the task of reviving the old Delft tradition and with the help of an old craftsman, Cornelius Tulk, and the co-operation of Mr. A. Le Comte, lecturer in decorative art at the Delft Polytechnical School, placed De Porceleyne Fles once more on the path of distinction and repute.

In 1884, a partnership was formed between Joost Thooft and a new collaborator Mr. A. Labouchere. So successful was the firm that, in a very short time. De Porcelevne Fles was again in a position to devote itself entirely to the production of handdecorated blue Delftware. In 1887. His Majesty King William III of the Netherlands had shown his interest in the rejuvenation of the craft by presenting the partners with a valuable collection of old Delftware, which still has a place of honour in the factory's De Porceleyne Fles showrooms. products gained honours at a number of exhibitions, notably Antwerp, Brussels and Paris.

In 1890, Mr. Joost Thooft had died, but the tradition was vigorously carried forward by Mr. Labouchere, who, in 1897, was honoured by his appoint-

ment as a member of the Jury of the International Exhibition at Brussels.

Since the inherent brittleness of the old tin-enamel ware had been one of the chief causes of its loss of popularity and decline, Joost Thooft had decided to start the production of the regenerated firm on the lines of the English ceramic industry. Indeed, the present-day blue Delftware is characterised by a white "biscuit," which, after baking at a high temperature, is much harder than the old Delftware and much less fragile. The white "biscuit" provides the background for the decoration, and, in a subsequent baking, receives a coating of trans-parent glaze. Of first importance throughout this period of re-establishment was the aesthetic effect and composition of colour and glaze, which also required special compositions of the

Thanks to much research and experimental work the new blue Delftware achieved an aesthetic and technical character of its own. Though motifs are still borrowed from the old ornamental decorations, the new technique of painting on the white biscuit affords the artist better possibilities of refinement in respect both of design and shading, and the motifs are often worked out in a different way in present day ware. Many new motifs are also used. Copies of landscapes, portraits, etc. have been reproduced in which the original colours have been translated into shades of corresponding value. Many prominent artists granted Mr. Labouchere permission to have their works reproduced. Some artists specially worked to this end. Some of the works of old Dutch masters, especially of the 17th century, such as Rembrandt, Frans Hals, Rubens, Van Dijck, Moreelse and others have been reproduced.

In 1903, De Porceleyne Fles was turned into a private limited company. (Incidentally, the limited company also celebrates its golden anniversary this year). Mr. H. W. Mauser, who had served the firm as technical manager became its first managing director. During the last fifty years various art wares other than blue Delftware have been developed and have been awarded the highest prizes at such exhibitions as Paris, St. Louis (U.S.A.), Turin and Roubaix. The Dutch Royal Family

has maintained its closest interest in the affairs of the company and in 1919 Queen Wilhelmina bestowed the predicate "Royal" to the firm's title. A souvenir plate in honour of the birth of Princess Juliana, now Queen Juliana, was among many of its kind produced by the firm.

Of the various types of ornamental ware, other than blue Delftware, produced by De Porceleyne Fles during the last half-century, some have achieved permanent status beside the original ware; others have been more

transitory in their success.

Of the former, the Red, Blue and Gold ware is perhaps as well known as This has been inspired by anv. precious specimens of the old Delft Pijnacker ware, copied toward the end of the 17th century from Japanese Imari porcelain, which are still preserved in many museums. The Reflet Métallique of De Porceleyne Fles is another established piece. As its name denotes its glazes are characterised by beautiful metallic reflexes. Because of the ever varying transmutation of colours it does not need decorating. The products of the old Persian pottery industry and of the allied industries in Asia Minor, with their lovely shapes and decorations and particularly their beautiful translucent colours, have also inspired designers and craftsmen of De Porceleyn Fles to produce a range of what they call New Delft and Lustre wares. Initially, more or less faithful copies of the Persian specimens were made, but gradually original designs have been evolved by the factory's artists. The New Delft decorations are in blue and green, with sometimes a touch of red, on an off-white background, or in black under a turquoise glaze. Lustre ware combines blue and green with exquisite gold lustres.

White Delftware, another ware produced by De Porceleyne Fles has, like the blue Delft, an old tradition dating back to the old tin-enamelled objects, which had no decoration. Its charm lies in the velvety white texture of the enamel. The modern white glaze has a unique tone and quality and is especially suited for flower vases in which the rich and varied colours of the flowers show up to good advantage.

The Decorated Craquelé, which De Porceleyne Fles has recently added to its range of art wares, is reminiscent of the craquelé of the Chinese Ming and Ch'ing dynasties and the on-glaze red decorations of the same periods. The present shapes are, however, quite different and belong entirely to modern Delft design.

De Porceleyne Fles have also produced cloisonné tiles in quite a big way, achieving colours of pleasing vividness by the use of crystallised glazes, which are one of their specialities. This technique is suited to the production of

be recognised as one of the essential products of Dutch art and craft.

Though essentially a manufacturer of art porcelain ware De Porceleyne Fles has also developed other quite extensive lines, as, for example, the production of decorative panels and tiles for architectural use and refractory materials for the construction of industrial plants such as boiler furnaces, gas ovens, metallurgical and various other installations.



The throwing and moulding department at De Porceleyne Fles

plaques in different sizes. Animal figures and national, provincial and municipal coats of arms are among the many motifs used. A special feature of the armorial plaques is the use of gold, which enriches the colour effect.

Though time has influenced the variety of shapes and decorations and has brought many additions to the range of wares produced by De Porceleyne Fles, there is a remarkable continuity about the many old specimens which are as much in demand as ever. Furthermore, through all the changes the blue Delftware has maintained its predominance over whatever other art wares De Porceleyne Fles has produced. It is a favourite decoration in Dutch homes and, abroad, has come to

In the range of architectural products may be mentioned the decorative panels in blue Delft, which have been employed, not only in private houses, but in public buildings both in Holland and abroad, notably the Grandducal Palace of Saxony-Weimar at Weimar. For ecclesiastical and other branches of architecture De Porcelevne Fles makes sectile tiles, as, for example, those used for the scenes of the Passion at St. Bavo Cathedral, Haarlem (after designs by Mr. H. A. Bijvoet), which are now nearing completion. In this field the firm lays claim to having prepared the ground for a new approach in respect of ceramic colours for architec-Also comparatively recently developed has been the production of

architectural faience and glazed facing bricks and strips for the facing of walls and façades, etc., and specially glazed wall tiles. For more utilitarian purposes a number of building tiles have been developed as, for example, tiles with swallow-tailed backs for work requiring a strong bond between lining and backwall.

Ranking foremost among the outstanding artists of De Porceleyne Fles during the last half-century have been Mr. Le Comte, who has been already mentioned, Mr. Leon Senf, who has been responsible for many kinds of art ware, decorative tilings for architecture and commemorative plates; Mr. J. Th. M. Visser, who has been an outstanding designer of ornamental, especially floral, decorations for blue Delftware and Mr. L. E. F. Bodart, who has specialised partly in architectural products and partly in art ware and cloisonné tiles. Among the younger generation are such talented men as W. D. Oosterloo, P. Senf (son of the late Leon Senf), J. C. W. Marijnissen, C. Hartog and H. Tieman.

## Gas Engineers Visit

## REFRACTORY WORKS AT HALIFAX

MEMBERS of the Manchester and District Junior Gas Association paid a recent well-attended visit to the works of companies subsidiary to Drakes Ltd., Constructional Gas Engineers, of Halifax.

Transport from Halifax Station to the works sidings of John Morton and Co. (Fireclay, Thornton) Ltd. was by special train. These works have large covered stockyards where pressed refractory squares, specials for coke oven, gas works and boiler setting are stored. Here, as a matter of interest, was erected a specimen cooling section in firebrick for use below the silica work in vertical retorts. Also in evidence were examples of special fireclay ends for horizontal retorts, together with D-shaped retort sections 7 ft. and 10 ft. in length.

In the carbonisation of coal, fireclay plays a leading part, and the Halifax beds provide a first-class raw material for the purpose. In addition, the local deposits, with added materials, are used in a thriving local industry in the manufacture of glass pots, insulating refractories, sanitary ware, etc. Geographically, the brickworks lie on a typical Pennine hillside near the stone-built village of Thornton—birthplace of the famous Brontë sisters. The former proprietors of the works mined, moulded and fired refractory materials for Drakes over a period of many years. So much so that locally the works were looked upon as Drakes', whose property, in fact, they finally became.

#### Mined Materials

At Morton's the deposit of fireclay lies at a depth of 50 yds., and occurs in a

bed approximately 4 ft. in thickness, which is associated with a seam of coal of indifferent quality. Naturally, this has necessitated the adoption of mining methods, and the material, loaded into small skips underground, is drawn up a shaft in the same way as mined coal and other minerals.

On arrival at the surface the fireclay is tipped in heaps for the purpose of weathering. This process is important as a means of enabling the following processes of grinding and mixing to be performed more readily. Then, too, during weathering, changes in the chemical and colloidal character of the clay of a beneficial nature also take place, and such changes cannot readily be reproduced by other means.

### Brickmaking

Weathered fireclay, then, is used in the manufacture of all fireclay goods at "Morton's." If required for machinemade squares the material, together with a predetermined proportion of grog, is first passed through an edge-runner mill. The ground fireclay is then made into a stiff paste with added water in a double-shafted mixer, whence it passes to a Bradley and Craven single brick-machine with an output of 1,200 squares per hour.

The bricks are then moved to a steamheated drying floor, where they dry slowly and without strain until ready for removal to the kilns.

Special shapes, such as are used in retort and boiler setting, coke-oven construction, etc., are moulded by hand from an intensively prepared clay/grog paste. This is milled to a somewhat wetter consistency than that considered Best informed Journal leading in the Silicate Industries Founded 1868



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suitable for the machine-made bricks.

For hand-moulding, clay paste is taken to the moulder's bench in bulk; and in moulding, the worker first picks up a suitable quantity of paste which he bumps roughly to shape on his bench, which has previously been dusted with firebrick dust. This operation is known as making a "clot." The maker now throws the "clot" with some force into a previously dusted wooden mould, filling up edges and corners by thumping with the two fists. Surplus paste is then removed by use of a wire bow, which is drawn over the top of the mould, the "cut off" being laid aside, cut face upwards, for incorporation in the next "clot" to be shaped.

The cut surface of the moulded brick is then dusted and smoothed, and the mould gently tapped, after which the brick is turned out on to the near-by drying floor and subjected to gentle heating until dry. Making larger and more awkward shapes demands methods in volving complicated moulds, and the use of gentle ramming. But finished specials seen on the stockyard exhibit the same well-filled corners and good arrises shown by the squares.

In a day of mechanisation it might appear strange to the layman to find that age-old hand methods still persist. But it should be understood that good handmade refractories are a quality product; and that it is easier and cheaper to make small quantities of complicated shapes by hand, rather than by a power press with metal-lined moulds.

After careful drying, bricks and shapes are fired in rectangular downdraught kilns. These warrant no special mention, although it was noticeable at the time of the visit that the kilns were "well found" an aid, of course, to even firing and the efficient use of fuel.

#### A Unique Machine

As has already been mentioned, horizontal retorts are a specialised product of the works, and Mr. Francis D. Drake, managing director of "Morton's," had arranged a striking demonstration in the extrusion of D-shaped retort sections, 24 in. × 16 in. × 3 in. thick, in lengths of 5 ft, and 8 ft.

When it is realised that a standard 10 ft, retort length weighs a ton, the skill and experience entailed in manufacture will better be understood. An extrusion process is used and the machine is said to be unique. Made in 1885, it operates hydraulically, and extrudes the sections vertically at a pressure of 2,000 p.s.i. From crown to sole, the machine measures 60 ft., the height being taken up by

pressure cylinder, clay chamber, operating space and balancing arrangement,

In work, the machine is operated by a team of craftsmen who appear to make light work of a heavy job. As has been said, extruded retort sections weigh a full ton each, and after cutting off they are transported by hand-operated overhead crane—hand operated for steadiness' sake.

Great care is necessary at this point, as the retort is in the plastic state. Handling is achieved by use of wood laggings, 4 in. × 1 in., tightly roped to the retort Spanish windlass fashion at three points, lifting being done by use of chain bridles secured over the laggings. In this way the retorts are moved with apparent ease, unmarked and undistorted.

### Drying and Burning

During drying, the retorts stand on end in a lofty drying shed, the overhead crane and the height of the up-ended goods making ample headroom a necessity. Drying is a lengthy operation, several weeks being occupied in the process. Great care is essential in the early stages, the current of air from an open door can "pull" a retort over inches from the vertical in the space of a few minutes.

The kiln in which the retorts are fired

also calls for comment. It is, so far as is known, the only rectangular downdraught kiln of its height with a removable arch of refractory-lined segments of a special cast iron. The kiln will hold thirty-three retorts, and is of a height comfortably to accommodate their great length. As is to be expected, the kiln is also serviced by overhead crane, setting, drawing and arch manipulation being accomplished by this means.

Firing is of necessity a long process. The kiln has six fire-holes, and smoking, and the subsequent preliminary heating during which the clay is decomposed, must be done very slowly in order safely to rid the ware of combined water and organic matter. Finishing temperatures here are of the order of 1,200° C.

The visitors were later entertained to luncheon by the directors of Drakes Ltd., Ovenden, and in a short speech of welcome Mr. John A. Drake, chairman and managing director, said that a unique feature of their organisation was that they were the only firm of gasworks contractors with their own design and drawing department, their own engineering works and foundry, and their own refractory clayworks.

Afterwards, the party toured the engineering works of a second subsidiary company. Drakes (Engineers) Ltd., where much of interest was to be seen.

## THE LONDON POTTERS

Centuries-old links between the London Thames-side potters of the first Elizabethan era and the vast present-day British ceramic industry were recalled at a luncheon held at the Savoy Hotel on 14th October to celebrate the centenary of the London Potters' Association.

Lambeth and Southwark delftware, Fulham salt-glaze stoneware, and Bow and Chelsea china are among the many contributions of London to British ceramic history, the influence of which can never be over-rated.

John Dwight, "the father of English ceramics," founded the famous Fulham Pottery in 1671. He brought the art of pottery-making to a degree of excellence previously unattained in this country, one of his outstanding technical achievements being a fine white stoneware which greatly influenced the potters of North Staffs.

In 1815, John Doulton, who had served his apprenticeship at Fulham under Dwight's grandson, established a small two-kiln pottery of his own in Lambeth, near the Vauxhall Pleasure Gardens. From this modest foundation have sprung the world-famous Royal Doulton Pot-

The first meeting of the London Potters' Association was held at the Bridge House Tavern, Southwark, on 23rd September, 1853. Membership was at first confined to "manufacturers resident within 40 miles of the Metropolis" but was later extended to stoneware potters in other parts of the country. Of the present member firms, apart from the Fulham Pottery and Poulton's already mentioned, several have foundations dating back from 150 to 250 years—a striking testimony to the important part tradition and continuity still play in this ancient craft which has become a modern industry.

At the luncheon, a terra-cotta bust of the Chairman, Mr. L. J. E. Hooper, a great-grandson of one of the founding members of the Association, was presented on behalf of the National Federation of General Stoneware Manufacturers by Mr. I. Winston Cheavin, Governing Director of the Fulham Pottery, in one of the kilns of which the bust had been fired.

## Properties of Foreign and Domestic Natural Graphites

A Summary of Technical Report 1814 issued by the American Bureau of Standards

NATURAL flake graphite is an essential ingredient for the crucibles widely used by foundries for melting non-ferrous metals. Because this type of graphite, normally imported from Madagascar, is classified as a strategic mineral, it is being purchased for storage in the National Stockpile. An earlier investigation by the National Bureau of Standards indicating that certain domestic graphites are fully as good as the traditional imported mineral has recently been extended to obtain complete technical data on the properties of eleven natural graphites from various domestic and foreign sources. This investigation, conducted by L. Mackles, R. A. Heindl, and L. E. Mong of the N.B.S. refractories laboratory, will aid in the preparation of a more effective specification for governing the quality of this commodity, whether it be procured from Madagascar or from other sources that may develop in the future

The sources of graphites included in the study are Alabama, Pennsylvania, Texas, Madagascar, Kenya, Ceylon, Korea, Canada, Mexico, Bavaria and Mozambique. The properties determined were those important in the successful use of the graphites for crucible manufacture—

chemical composition, thermal reactions, surface area, and the refractoriness of the ash. The chemical composition is useful to indicate the chemical reactions between the graphite ash and the bond clay in crucibles and also between the ash and the molten metal and its slag. The refractoriness of the ash indicates the temperature at which the ash softened as a result of fusion. It was thought that the thermal reactions might aid in identifying minerals present in the graphite before heat treatment and also indicate physical changes of the graphite itself. The surface area measurements were intended to give a measure of the compactness of the graphite grains or flakes

The ash of the graphites ranged from a low of 1.62 per cent for that from Canada to 34.8 per cent for that from Mozambique. However, the high ash of the latter was an exception because the other graphite ashes ranged below 16.0 per cent. The remaining major constituents were essentially the same for all the graphites and no "tag" elements were found that might identify the source of the graphites. The percentages of the elements were, however, different. The silicalumina ratios ranged from 2.0 to 10.9.



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Phone: Stoke-on-Trent 84201 the total alkali from 0.4 to 7.8 mole per cent and the total alkaline earth from 0.6

to 43.6 mole per cent.

The refractoriness of the ashes of the graphites ranged from a pyrometric cone equivalent of 5 (1180 C) to a P.C.E. of 28 (1615 C). Crucibles manufactured from Bavarian graphite, the ash of which has a P.C.E. of 5, have a life in the foundry equally as good as that of crucibles manufactured from either Madagascar or Alabama graphites, the ashes of which have a P.C.E. of 27. This indicates that the refractoriness of the ash is no criterion for judging the quality of a graphite for use in crucible manufacture. This is probably due, in part, to the fact that the clays added as a bonding material combine with the small percentage of ash to form inorganic mixtures which may have a re-fractoriness much higher than the P.C.E. of the ash and also much higher than the temperature at which the crucible is used.

The data obtained from differential thermal analyses in air atmosphere were not readily reproducible. The curves resulting from the tests indicate not only the temperature differences caused by the oxidation of the graphite but also by any other heat effects occurring in the sample. The rate of burning can be determined quantitatively by other methods and should therefore be eliminated from the thermal analysis. There was no evidence of combustion when nitrogen was used as the atmosphere for the sample container. The curves resulting from the tests gave no indications of thermal reactions for any of the graphites with the exception of that from Mozambique. No thermal effects were expected for the graphitic material since no crystalline changes in graphite have been reported for the temperature range 20 to 1000 C used in these tests. The small thermal change occurring in the graphite from Mozambique indicated that more than 10 per cent, kaolinite may be present and the analysis of the

ash supported this premise.

The total surface area of the graphites in the "as received" condition ranged from 0.34 to 26.50 square meters per gram. The upper value of the range was noted for the graphite from Mexico and is an exception because all the graphite have a surface area less than four square meters per gram. The graphites from Canada, Kenya and Mozambique in contradistinction to that from Mexico are quite solid in make-up. The graphites from Alabama, Pennsylvania and Madagascar fall within the narrow range of 2.20 to 3.47 square meters per gram. Because high quality crucibles are obtained from these three graphites, the surface area values obtained may have some significance. The surface areas of the graphites were determined also after heating them at 400 C. Such heating would tend to drive off any residual flotation oils that might interfere with the sorption of the nitrogen gas necessary in this test. The surface areas of the graphites from Madagascar, Alabama, and Pennsylvania increased significantly after the heat treatment, whereas the others remained unchanged or changed only slightly.

## NEW TYPE SWEDISH HEAT RESISTANT GLASS EVOLVED

The outcome of more than ten years' work of experimentation and research a new type of borosilicate glass has recently been put into production by the Ruda Glassworks, which is a subsidiary of Svenska Ackumulator Aktiebolaget Jungner, of Stockholm, the large producers of Nife storage batteries, signalling equipment and optical instruments.

Produced in modern furnaces of the day-tank type as well as of the continuous type this special glass is characterised by its excellent chemical stability, its high softening point and a low co-efficient of expansion, the actual figures being as

follows:

Linear co-efficient of exp	$3.7 \times 10^{-1}$		
Transformation point		524	C.
Deformation point		620	C.
Softening point		800	C.
Hydrolytic resistance		Cla	ss I
Acid resistance		Cla	ss I
Alkali resistance (0.56)	mg. cm	) Class	III



Extremely accurate control of the raw materials and the processes of manufacture as well as its balanced chemical and physical properties make the Nife glass particularly suited to laboratory utensils such as beakers, Erlenmeyer flasks, Kjeldahl flasks, boiling flasks, distillation flasks, filtering flasks, crystallising and petri dishes, though it is also used for the manufacture of television and radar valves, coffee percolators and other household products which incorporates heat-resisting glass.

The Jungner Co. is the only factory manufacturing special glass in Sweden.

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## STABILISATION OF ZIRCONIUM DIOXIDE



Ceramic research scientists in the Flight Research Laboratory at the U.S. Air Research and Development Command's Wright Air Development Centre have recently developed a new technique for the stabilisation of zirconium dioxide, a material capable of withstanding temperatures over 4,000° F.

By employing special additives with zirconium dioxide, this necessary stabilisation can be accomplished at lower temperatures than heretofore known. The technique will enable the use of new fabrication methods thus reducing manufacturing costs and making possible new utilisation of this material.

This high temperature ceramic material will play an important role in future aircraft developments, turbo-jets, and high temperature metallurgical research.

Our illustration shows slip casting of zirconium dioxide for a test specimen. After solidifying, it will be fired at 3,400° F.

## NATIONAL INDUSTRIAL FUEL EFFICIENCY SERVICE

THE above is the name of the new company emerging from the Pilkington Committee to provide advice to industry and non-industrial establishments—not domestic users—to give practical help in economic fuel usage. The chairman is Sir Leslie Hollinghurst and the directors appointed are:

Sir Patrick J. Dollan, chairman, Scottish Fuel Efficiency Advisory Committee.

Sir John Hacking, deputy chairman (operations), British Electricity Authority.

Sir Edward Herbert, deputy chairman and managing director, William Hollins and Co. Ltd., Nottingham. Mr. Leslie A. W. Jenkins, joint managing director, John Wright and Sons (Veneers) Ltd., London.

Mr. Henry F. H. Jones, deputy chairman, the Gas Council.

Mr. E. Julian Pode, J.P., managing director, the Steel Company of Wales, Ltd.

Mr. Jack Tanner, chairman of the T.U.C. General Council and a member of the British Productivity Council.

The company will be financed from the National Coal Board, the British Electricity Authority and the Gas Council, with possible contributions voluntarily from industry.

## FELLOWSHIP IN METALLURGY

THE United Steel Companies Ltd. announce that they have established a Research Fellowship in Metallurgy in the University of Sheffield and this will be tenable in the Department of Metallurgy.

The object of the fellowship will be to advance metallurgical knowledge and not to train men for research. The persons to be appointed from time to time will therefore be those who have already served their apprenticeship in research and have shown ability to conduct independent investigations. The field of study within which they will be expected to work will be ferrous metallurgy, but this does not exclude the appointment of researchers in refractory matters, knowledge of which is of great importance in ferrous metallurgy.

## HIGHER U.S. GLASS TARIFFS OPPOSED BY SWEDEN

The Swedish Ambassador in Washington, Mr. Eric Boheman, has made representations to the U.S. Department of State against the proposed increase in American tariffs on glassware, according to reports in the Stockholm press. Next to Western Germany, Sweden claims to be the largest supplier of glass to the United States.

It is believed that Japanese glass exports to the United States, though still on a relatively small scale, have caused some concern among U.S. glass manufacturers. The question of higher tariffs, up to 90 per cent, of the value of the goods, will probably be brought before President Eisenhower. Swedish commentators underline that several European countries, including Great Britain, Western Germany. Italy, Holland, Austria and Belgium, support Sweden's point of view in the matter. Last year Sweden's exports of glassware to the United States totalled Kr. 4,500,000 (£310,345 or \$900,000).

## ALLINITE LIMITED

M.R. W. B. DODGSON, A.M.I.B.E., managing director, Allinite Ltd., the kiln, furnace and boiler insulation specialists, announces that the company are now operating from premises at Brick Kiln Lane, Etruria, Stoke-on-Trent.

Products of interest to the ceramic industry include "Allinite Compound One," a Vermiculite-Ciment Fondu mix for use at temperatures of the order of 1,100° C. "Allinite Supermix Two" is compounded for under-floor and over-arch conditions in kilns of all types. "Supermix" is also finding extensive use in the insulation of kiln-car tops.

A feature of Allinite insulation products is that they are delivered in correctly proportioned "dry mix" form, needing only the addition of water to produce ready-to-lay insulating and/or refractory concretes.

Allinite mixes, we are informed, are also supplied in the form of bricks and blocks.

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Institute of General Managers. Over 100 chief executives attended the inaugural dinner of the Institute of General Managers, at the Savoy Hotel, London, on Friday, 20th November, 1953. Guests of honour included Sir Rupert De la Bere, Bt., K.C.V.O., M.P., and Sir Patrick Hannon. A number of managing directors and general managers have recently formed the Institute of General Managers. Productivity team after productivity team has emphasised the vital part played by top management in American industry. In this country the need for a powerful and representative professional institute of chief executives has become increasingly apparent. The drive for greater productivity and management effectiveness in industry has added emphasis to this need. Those interested should apply for further information to the Registrar, Institute of General Managers, 86 Eccleston Square, London, S.W.1.

Elcontrol Ltd.—During the past twelve months Elcontrol Ltd., 10 Wyndham Place, London, W.I, have introduced a number of new industrial control equipments and modified and improved a number of existing items. Details of these are available from the company as follows: F.S.M. Furnace Safeguard Equipment (Data Sheets F.S.M. and F.S.5M.); FS.7 Furnace Safeguard Equipment. (Data Sheet F.S.7); Photoelectric Registration Controller. (Data Sheet P.R.C.); High Speed (Data Sheet Photoelectric Counter. F.S.C.); Current Overload Relays. (Data Sheet O.R.); Proximity Switch. (Data Sheet 9); Liquid Level Control Equipment. (Data Sheets 11 (Control Units) and 12 (Prohe Fittings)); Twilight Switch. (Data Sheet P.S.L.).

"Carbinert." - From The Morgan Crucible Co. Ltd. we have received a leaflet dealing with Carbinert (impervious carbon and graphite). Properties of Carbinert are stated as being: wide range of resistance to chemical attack; low thermal reversible expansion; good mechanical strength; high resistance to thermal shock; high thermal conductivity of graphite relatively low thermal conductivity of carbon; good electrical conductivity; self - lubrication and high resistance to wear; can be machined to fine limits. It is suggested that the field in which Carbinert offers the greatest potentiality is in the construction of heat transfer equipment, and four main types of heat exchanger manufactured from the product, the shell and tube (or tube bundle), the plate heater, the Cascade cooler and the bayonet heater

G.E.C. Products.—The General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2, have just published a booklet entitled *Lists of Products*, covering the G.E.C. and associated manufacturing companies. Its purpose is primarily to help buyers of electrical and mechanical equipment, but it is also invaluable in giving a concise résumé of the wide variety of products handled by the organisation.

Correction.—We must apologise for a misprint which occurred in a short note under the heading "Furane Resin Supplies" in the October, 1953, issue of Ceramics. In the last line of the second paragraph there is a reference to "furnace" resins. This should, of course, be "furane" resins. Our thanks to Leicester, Lovell & Co. Ltd., who supply this material, for pointing out the mistake.

### APPOINTMENT VACANT

CERAMIC TECHNOLOGIST required by The Plessey Co. Ltd., Towcester, Northants, to assist in the control and production of low-loss steartite and high permattivity ceramics. Candidates should have a good technical education, and a working knowledge of the above products, or practical experience in electrical porcelain. Remuneration will be according to experience and qualifications. Please reply, quoting reference C/815, giving full details of qualifications, experience and salary required. To: The Plessey Co. Ltd., Ilford, Essex.

#### FOR SALE

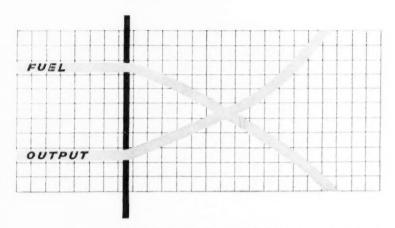
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